Original Article

Evaluation of the result of dynamic hip screw fixation in unstable trochanteric fracture of femur
Islam KM, Alam M, Mahmud AA, Ahammed S

The ORION Medical Journal 2007 May;27:458-462

Abstract
Background: Fracture of the neck of femur is the common injury seen in the orthopaedic practice. Aim of the study was to evaluate the result of Dynamic Hip Screw (DHS) fixation in unstable trochanteric fracture of femur. Method: 36 elderly patients, above the age of 50 years who presented with unstable trochanteric fracture in the Department of Orthopaedic surgery BSMMU from July 2004 to June 2006 were treated operatively by DHS and were followed up for a mean period of 9 months. The method of operation was close reduction with image intensifier (C-arm) technique operation was done in lateral Watson Jones approach. Results: The mean age of the patients was 65.5 years (range: 52-85). Of them, 21 were male and 15 were female, right sided injury was 23 in number and left sided was 13. Early complications were: non specific pain for 5 (13.8%) cases, stitch infection in 3 (8.4%), urinary tract infection in 2 (5.6%) cases, cutout of lag screw was found in 1 (2.8%) cases during follow up. Radiological improvement was observed in 32 (88.9%) patients in 24 weeks follow-up. The overall results were satisfactory in 26 (72.2%) cases and unsatisfactory in 10 (27.8%) cases.

Key word
Unstable trochanteric fracture, treated by DHS.

Introduction
The trochanteric region is defined as the area bordered proximally by the line of attachment of the hip joint capsule and distally by the inferior aspect of the lesser trochanter. The words intertrochanteric and pertrochanteric are usually used synonymously to depict features within this region. Due to number of unpropitious factors, trochanteric fractures pose a challenge to the orthopaedic surgeon-typically, an elderly patient who tolerates recumbency poorly, suffers an unstable fracture in osteoporotic bone, engaging the area of the skeleton with the highest load1. Hip fractures are leading cause of death and disability among the elderly3. Seventy-five percent of the intertrochanteric fractures are unstable3. The incidence of unstable trochanteric fractures increases with age because of increase of the average life expectancy; the fractures of the proximal part of femur have been marked as one of the biggest problems of the society, trochanteric fractures are around four times more frequent than the fractures of the proximal part of the femur. Women are three times more liable to these types of fractures than men due to their wider pelvis and because tend to be a less active, developed osteoporosis earlier and tend to live longer than men4,22.

Treatment goals for this patient population include early rehabilitation, restoration of the anatomic alignment of the proximal part of femur and maintenance of the fracture reduction2. Fracture occurs through the highly vascular cancellous bone and usually heals within 8 to 12 weeks, regardless of the methods of treatment, in almost all cases. However, malunion and varus angulation are common. The demand on the patient, nursing staff and the length of hospitalization period render conservative method of treatment unacceptable today6.

1. Dr. Kazi Mazharul Islam, MBBS, MS (Ortho), Associate Professor, Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University.
2. Dr. Mahbubul Alam, MBBS, MS (Ortho), Resident, Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University.
3. Dr. Abdullah-Al-Mahmud, MBBS, MS (Ortho), Resident, Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University.
4. Dr. Serajuddin Ahammed, MBBS, MS (Ortho), Professor and Chairman, Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University.
In fractures involving the lesser trochanter, poor load transfer over the fracture surfaces with rigid implants, which remain subjected to high loads. Various types of osteotomies were proposed to achieve a primary stable fracture configuration, and these procedures appeared to be beneficial in selected unstable fractures. However complications were reported related to the extended procedure, such as an increase in the rate of infection and impaired functional outcome.

There are several devices for internal fixation of trochanteric fractures, namely Dynamic Hip Screw, Smith-Petersen triflanged nail, Gamma interlocking nail, external fixation also use and sometimes arthroplasty, those who are suffering from severe degenerative changes of the femoral head either of osteoarthritis or rheumatoid arthritis may be consider for arthroplasty.\(^8,21\)

Unstable fractures are those where there is poor contact between fracture fragments (displaced), comminuting, or a fracture pattern is such that weight bearing forces tend to displace the fracture further or in reverse oblique type. Unstable fracture usually can be treated by anatomical reduction with the use of collapsible fixation devices, such as hip compression screws, such collapsible internal fixation device permit the proximal fragment to collapse or settle as the fixation device seeking its own position of stability\(^11\).

The Sliding Hip Screw is widely used for fixation of pertrochanteric fractures.\(^12,13\) In the operative treatment dynamic internal fixation device specially DHS enables effective healing of the fracture with the minimal possibility of mechanical complication.

**Patients and methods**

The study design was at BSMMU, approved by our ethics committee. 36 patients with unstable trochanteric fracture were selected in this study. It was prospective, non randomized study; purposive sampling technique was followed as per inclusion and exclusion criteria. The inclusion criteria were age over 50 years, unstable trochanteric fracture of femur, injury was less than one month of old.

Exclusion criteria included basal neck fracture, subtrochanteric fracture, pathological fracture, open fracture, presence of infection; patient is unfit for anaesthesia and major surgical intervention.

Informed consents were taken from the patients or legal guardians after duly informing about the procedure of treatment, anticipated results, possible advantages, disadvantages and complication of all ethical issues.

Assessment of the patient was done after detail history, clinical examination (general, systemic and local) and relevant investigations were performed for every case.

Investigations included a) Blood: Total count, Differential count, Haemoglobin %, ESR, Sugar (Random/Fasting), Urea, Creatinine, HbsAg b) Urine: Routine and Microscopic Examination c) X-ray pelvis-A/P view, X-Ray Chest P/A view d) ECG.

**Pre operative planning:** After clinical and radiological assessment preoperative check up were done then informed written consent were taken for operation.

**Technique of operation:** Under spinal anaesthesia and C-arm guide patient was positioned and close reduction was done then fracture site was explored and DHS and plate was fixed accordingly, with securing all haemostasis a drain was kept in situ then wound was closed accordingly.

**Post operative follow-up:** Early post operative time patients were treated with analgesic, antibiotic, sedative, drain was removed by, 24 to 72 hours, and then early mobilize with crutches when pain was subsided, stitch was removed by 10-13 days and discharge the patient with advice to come for follow-up.

Patient was assessed clinically and radiologically every 6 weeks, 12 weeks and
24 weeks interval. Collected data were complied and appropriate analysis was done.

Final clinical outcome
The results in relation to functional ability were analyzed using the criteria followed by Kyle et al. (1979) is given below. At the end of follow-up, the results of the operation were rated into following four categories: Satisfactory (excellent+good), unsatisfactory (fair+poor).

<table>
<thead>
<tr>
<th>Findings</th>
<th>6 weeks No. (%)</th>
<th>12 weeks No. (%)</th>
<th>24 weeks No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal range of motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited range of motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain on any motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No or minimal limp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noticeable limp</td>
<td>2 (5.6)</td>
<td>10 (27.8)</td>
<td>26 (72.2)</td>
</tr>
<tr>
<td>Noticeable limp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W heelchair-bound or non ambulatory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip joint range of motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full</td>
<td>2 (5.6)</td>
<td>4 (11.1)</td>
<td>10 (27.8)</td>
</tr>
<tr>
<td>Not possible due to pain</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-II shows follow up outcome regarding limping, walking ability and hip joint motion. Out of 36 (100%) patients, 16 (44.4%) patients had no limping and two (5.6%) became unable to bear weight at 24 weeks follow up. 14 (38.9%) patients regained previous walking ability. Hip movement was not possible in two (5.6%) patient at 24 weeks follow up. All parameters show gradual improvement.

Results
Average age of the patients were 65.05 years with a minimum of 52 and maximum of 85 years. Out of 36 patients, 21 (58.3%) were male and 15 (41.7%) were female. Most of the subjects were either retired person (47.2%) or housewife (41.7%). Mostly the causes of injury were domestic fall (83.3%), only 16.7% suffered injuries from RTA. Right side was affected in 23 (63.9%) patients and the left side was affected in 13 (36.1%) patients. The average time from injury to operation was 15.4 days. The mean duration of operation was 61.5 minutes (range: 45-75 minutes).

The mean hospital stay of the patients was 21.5 days (range: 14 to 28 days). The average time from operation to discharge was 10.7 days. Mean period of follow-up was 9 months, range from 6 to 12 months. The early complications were: non specific pain for 5 (13.8%) cases, stitch infection in 3 (8.4%) cases, urinary tract infection in 2 (5.6%) cases and the late complication were cutout of the lag screw was found in 1 (2.8%) cases during follow-up. Overall radiological improvement was observed in 32 (88.9%) patients in 24 weeks follow-up. The overall results were satisfactory in 26 (72.2%) cases and unsatisfactory in 10 (27.8%) cases.

Table III: Shows the early and late complication of the patients. Statistically there is no significant difference between highest and lowest complication rates (complication in the patients (n=36)).
Discussion
These patients were evaluated with a mean follow-up of 9 months (range: 6 to 12 months) showed a satisfactory (good to excellent) result of 72.2 percent. This result is comparable with similar result of study. They followed up 107 cases of intertrochanteric fractures fixed with Richards dynamic compression device until union of the fracture or failure of fixation, and the clinical outcome was successful in 92.6 percent.

In the present series, the mean age of 36 patients is 65.05 years (range: 52-85 years). The mean age of the patients in this series is comparable to other series.

In the present series as in all other series, a difference is found in sex incidence, that is 21 (58.3%) patients are male and 15 (41.7%) are female.

This may be due to the fact that female elderly patients over 50 years are brought to the hospital for operative treatment less frequently than males. Besides, rural woman in our country are more active and chance of osteoporosis may be less. Probably this might be the cause of difference of sex incidence in the present series.

Thirty two (88.9%) patients of the present series are sedentary workers that are housewife, retired serviceholder, etc. and only 4 (11.1%) are serviceholders and they are male and relatively younger.

Out of 36 patients, 6 (16.7%) gave the history of road traffic accident (RTA), on the other hand 30 (83.3%) gave the history of fall at home or outside home. The incidence of RTA is more among males probably due to our social setup, male are busy outside the home and females are housewives, remain at home.

It is interesting to note that in 23 (63.9%) cases injury involves the right side and only in 13 (36.1%) cases involve the left side. Other study also reported same.

Most (80%) of our population live in rural areas. Due to illiteracy, superstition, poor socioeconomic status and bad communication system, majority of the patients are treated late, ranging from several days to weeks. The patients in developed countries are treated within 48 to 72 hours. But in the present series operations were performed average 15.6 days after injury.

The position of the lag screw within the femoral heads is an important factor in fixation of the trochanteric fracture by DHS. In this series, central position (2/2) was achieved in 30 (83.3%), central in anteroposterior and posterior in lateral roentgenogram (2/3) was next position (3 cases, 8.3%). One case (2.8%) also found in each 2/1, 3/3 and 1/3 position.

The mean duration of operation in the present study was 61.5 minutes (range: 45-90 minutes). It is also a little difference in comparison to other study. As for example, average 28 minutes, ranging from 15 to 90 minutes and 69 ± 32 minutes ranging from 20 to 240 minutes, although they did the operate under image intensifier control.

Physical therapy is essential for successful restoration of mobility. The goal of physical therapy is a return to previous activity and occupational levels. Moreover, early ambulation is essential to avoid morbidity and mortality related to these fractures in elderly patients. Most of the authors are in favor of partial weightbearing within three to five days after operation depending on the stability of fixation. In our hospital, operation was delayed (average 15.6 days). Although isometric exercises were started on the day of operation, average time to walk for partial
weightbearing with crutch supports was 4 to 6 weeks.

In the present series of 36 cases, excellent result is achieved in 9 (25%) patients, good result in 17 (47.2%) patients, fair result in 7 (19.4%) patients and poor result is in 3 (8.4%). Therefore, satisfactory (excellent plus good) result is 72.2 percent and unsatisfactory (fair plus poor) result is 27.8 percent.

In the present series, 26 (72.2) cases the result is satisfactory (excellent plus good), whereas 10 (27.8%) cases result is unsatisfactory (fair and poor) due to all the cases are unstable fracture and this group of patient gave early weightbearing and not come in time of post operative follow up. Heyse-Moore et al. (1983) also showed that 100 percent clinical success rate in cases of stable fracture fixed by DHS and 91.8 percent clinical success rate in case of unstable fracture but statistically this difference of results between stable and unstable fracture in their study was not significant. Although in this study the overall results show a good correlation with other series.

In the present series, only in 1 (2.8%) case, the lag screw cutout of the femoral head with varus angulations, it was due to early weightbearing. Satisfactory radiological healing in acceptable alignment occurs in the remaining 34 cases (94.7%) radiological healing or satisfactory clinical outcome is possible even after mechanical failure. As for example, 54 percent radiological failure but 23 percent clinical failure in their Jewett nail plate group of patients and 9.3 percent radiological failure but 7.4 percent clinical failure in their Richards dynamic hip screw group of patients in other study. In some study shows 69 percent mechanical failure in fixation of intertrochanteric fracture with Jewett fixed angle nail plate and only 16 percent with DHS. It is clear from these two studies that mechanical or radiological failure is much more common with Jewett fixed angle nail plate.

Overall radiological improvement was observed in 34 (94.4%) patients at 6 weeks and 12 weeks follow up, however at 24 weeks it declined to 32 (89.9%). Unsatisfactory result in terms of radiological assessment was in 2 (5.6%) at 6 and 12 weeks follow up and 4 (11.1%) cases at 24 weeks follow up.

There is significant difference between satisfactory and unsatisfactory groups in terms of radiological assessment at 24 weeks after operation. The cases of unsatisfactory radiological findings were due to advanced age, osteoporotic bone, unstable fracture, failure to attend the hospital in time for follow up, negligence of the attendants and early weight bearing to some extent.

Full range of painless hip movement is given the prime importance so far the grading of result is concerned. Painless full range of motion is very prerequisite for leading a normal life. This is why this parameter is taken as the main factor up on which the status of the final result depends. Out of 36 patients in the present series, 1 (2.8%) patients had pain of such severity that motion caused pain, it was due to lag screw cut out of the femoral head superiorly with varus angulation.

Three (8.4%) patients had just stitch infection causative organism is Staphylococcus aureus in all the cases and was sensitive to flucloxacin, controlled within 5 days of all the cases after removal of stitches and antibiotic therapy, antibiotic was continued up to two weeks.

The infection rate was 2.1 and 0.8 percent deep infection rate reported in some study. In our series, the infection may be due to postoperative contamination with infected materials. Regarding systemic complication two (5.6%) patient developed urinary tract infection, the causative organism was Escherichia coli, cured by ciprofloxacin.

It is worthy to mention that no patient in this series developed thromboembolic complications, which are commonly reported in western literature. One of the aims of operative treatment is to reduce the hospital stay and there by reduce the cost and burden.

---

Original Article
on hospital and nursing staff. In the present series though the mean hospital stay is 21.5 days (range: 14 to 28 days), the average time to operation to discharge 10.7 days. So, the major part of delay is from admission to enter in to the operation room. Even the series is comparable to other series in this regard. Bannister et al. (1990) showed mean hospital stay 34.5 days, higher than this series. In some study showed 37.32 hours. In one hand our patients delayed to reach the hospital, on the other hand due to variety of reasons, like lack of operating room facility, we cannot perform the operation on our patient in time, within 48 to 72 hours. Even then, the overall result is comparable to other series.

It is felt that closed reduction and internal fixation of unstable intertrochanteric fracture with Dynamic Hip Screw and barrel-plate assembly does not carry any excessive risk of morbidity and mortality, because early mobilization and rehabilitation have been facilitated by the use of the device. As our patients are late and already few days have been spent in bed, it is more important to mobilize the patients earlier by performing their operation with this sliding device.

Conclusion and recommendation
The treatment of trochanteric fracture of the femur by Dynamic Hip Screw greatly simplifies nursing care, allows early mobilization and reduces morbidity and mortality, specially in patient over 50 years of age. The most important point of consideration is the achievement of stable fixation of the unstable fracture, so that early walking with crutch support would be possible.

Considering all these points, internal fixation by Dynamic Hip Screw (DHS) has been proved to be the treatment of choice for trochanteric fractures of the femur, more importantly for the elderly people over 50.

This can be followed up later on to get a long-term result and the series can also be enlarged by adding more cases to determine more accurate result.

References


